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ADHESIVE COATINGS CONTAINING SUPERABSORBENT PARTICLES

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Abstract

At least one face of a substrate coated with water-absorbing solid particles carries a pressure-sensitive adhesive layer in which the water-absorbing solid particles are fixed.

The invention concerns substrates coated with water-absorbing solid particles, in which at least one side carries an adhesive layer in which water-absorbing solid particles are fixed.

Moreover, the invention concerns adhesive strips, which are made of these coated substrates and which can be unrolled, the use of the coated substrates for the production of sanitary products or as protection from moisture, and a method for the production of the coated substrates.

Flat, textile materials with superabsorbing characteristics for the absorption of liquids are becoming increasingly more widespread. Typical fields of application include disposable diapers for babies, sanitary napkins, or products for adult incontinence. Usually, these superabsorbing articles are put together in such a way that they contain a more or less voluminous layer of cellulose (fluff), into which the superabsorbing (SA) particles are scattered. If a liquid reaches this layer, it is absorbed by the SA particles, wherein the liquid is conducted to the particles via the hydrophilic fluff fibers. The water-intake capacity can be a multiple of the material's own weight. The construction is usually used and described here has the disadvantage that it leads to sanitary products that are several mm to cm thick, and thus often only insufficiently fulfill the requirement of appearing as discreetly as possible when these

articles on a human body. This is particularly true for adult incontinence.

There is therefore the need to produce a flat material with a high water-intake capacity which is suitable for the construction of sanitary products, such as incontinence articles, baby disposable diapers or sanitary napkins, and is clearly thinner than the usual fluff-containing products.

Furthermore, there is the need to use water-retaining layers also in other areas. For example, superabsorbing particles are used in the sheathing of submarine cables, in order to protect the conducting material from the penetration of water. Here, the SA particles swell, forming thereby a water-impermeable layer and bulkhead off the interior of the sheathing from the penetration of more liquid. The coating with SA particles is usually carried out by immersing the cable into a liquid containing SA particles. This method is, of course, not a workable way when a repair is needed. A portable system that offers a self-adhesive protection from moisture or water would be desirable here. This portable system could be used, of course, in all other areas also in which water-blocking layers are desired as moisture protection, as in the construction industry, for example.

In the unrepublished German Patent Application No. P 4,411,896.1 (our Ref. 44788), the binding of superabsorbing particles of nonwoven fabrics with the aid of the binder of the nonwoven fabrics is described. The products produced in this manner are suitable for the production of thin sanitary articles, but not as a portable system for moisture protection, as described above.

The goal of the invention under consideration was therefore water-absorbing material suitable for the production of thin sanitary products and as a portable system for moisture protection.

Accordingly, the coated substances defined in the beginning and their use for the production of sanitary products or as moisture protection were found. A method was also found for the production of the coated substrates.

The substrates coated in accordance with the invention are generally flat substrates. In particular, they are, for example, paper, films, for example made of metal or plastic, or fabrics made of natural or synthetic fibers. Preferred are plastic films made of polyester, such as polyethylene terephthalate, or polyolefins, such as polyethylene, polypropylene, oriented polypropylene or polyamides. Preferred fabrics are those made of plastic, for example polyolefins or polyamides.

The substrates are coated on at least one side with an adhesive. The adhesive layer preferably has a thickness smaller than 1 mm, in particular 1-200 μm .

As an adhesive, one can use all common adhesives. Preferably, adhesives based on a radically polymerized polymer, synthesized from radically polymerizable monomers.

The polymer preferably consists of at least in part so-called main monomers, also selected $\text{C}_1\text{-C}_{20}$ -alkyl (meth)acrylates, vinyl esters from carboxylic acids containing up to 20 C atoms, vinyl aromatics with up to 20 C atoms, ethylenically unsaturated nitriles, vinyl halides, vinyl ethers of alcohols containing 1-10 C atoms, aliphatic hydrocarbons with 2-8 C atoms and 1 or 2 double bonds or mixtures of these monomers. The polymer preferably consists of at least 40 wt%, particularly preferable, 60 wt%, and very particularly preferable 75 wt% of these main monomers or their mixtures.

One can mention, for example, methacrylic acid alkyl ester with a $\text{C}_1\text{-C}_{10}$ -alkyl radical, such as methyl methacrylate, methyl

acrylate, n-butyl acrylate, ethyl acrylate, and 2-ethylhexyl acrylate.

In particular, mixtures of the methacrylic acid alkyl esters are also suitable.

Vinyl esters of carboxylic acids with 1-20 C atoms are, for example, vinyl laurate, vinyl stearate, vinyl propionate, Versatic acid vinyl ester, and vinyl acetate.

As vinyl aromatic compounds, vinyltoluene, α - and p-methylstyrene, α -butylstyrene, 4-n-butylstyrene, 4-n-decylstyrene and, preferably, styrene can be taken into consideration. Examples of nitriles are acrylonitrile and methacrylonitrile.

The vinyl halides are ethylenically unsaturated compounds, substituted with chlorine, fluorine, or bromine, preferably vinyl chloride and vinylidene chloride.

As vinyl ethers, one can mention, for example, vinyl methyl ether or vinyl isobutyl ether. Vinyl ethers of alcohols containing 1-4 C atoms is preferred.

As hydrocarbons with 2-8 C atoms and two olefinic double bonds, one can mention butadiene, isoprene, and chloroprene.

In addition to these main monomers, other monomers, for example, hydroxy group-containing monomers, in particular C_1 - C_{10} -hydroxyalkyl methacrylates, methacrylamide, ethylenically unsaturated acids, in particular carboxylic acids, such as methacrylic acid or itaconic acid, dicarboxylic acids and their anhydrides or semiesters, for example, maleic acid, fumaric acid, and maleic anhydride, can be contained in the polymer.

The polymer can contain, if necessary, cross-linking monomers with 2 or more double bonds as additional monomers also. The content of the crosslinking monomers is generally, if desired at all, 0.05-5 wt%, based on the polymer.

In the case of polymers that can be cross-linked by UV radiation, copolymerizable, ethylenically unsaturated photoinitiators, for example, acetophenone or benzophenone derivatives, can also be taken into consideration as additional monomers, as they are known, for example, from European Patent No. A-246,848 or German Patent No. A-3,844,445. In the case of their joint use, their fraction generally is 0.05-5, preferably 0.1 to 3 wt%.

The production of the polymers, for example, by radical polymerization can, for example, be carried out in solution, for example, of an organic solvent (solution polymerization), in aqueous dispersion (emulsion polymerization, suspension polymerization) or in bulk--that is, essentially in the absence of water or organic solvents (bulk polymerization).

The emulsion polymerization can be carried out, for example, discontinuously, with or without the use of seed latexes, with the presence of all or individual components of the reaction mixture, or preferably with a partial presence and subsequent metering in of the components or of the individual components of the reaction mixture, or according to the metering method without the initial presence of the components.

The monomers can be polymerized during an emulsion polymerization, as usual, in the presence of a water-soluble initiator and an emulsifier at preferably 30-95°C.

Suitable initiators are, for example, sodium, potassium, and ammonium persulfate, tert-butyl hydroperoxides, water-soluble azo compounds or also redox initiators, such as H_2O_2 /ascorbic acid.

As emulsifiers, for example, alkali metal salts of longer-chain fatty acids, alkyl sulfates, alkyl sulfonates, alkylated aryl sulfonates, or alkylated biphenyl ether sulfonates are used.

Moreover, reaction products of alkylene oxides, in particular ethylene or propylene oxide with fatty alcohols, acids, or phenol, or alkyl phenols can be taken into consideration as emulsifiers.

In the case of aqueous secondary dispersions, the copolymer is first produced by solution polymerization in an organic solvent and subsequently with the addition of salt-forming agents, for example, of ammonia to carboxylic acid group-containing copolymers, dispersed in water without the use of an emulsifier or dispergator. The organic solvent can be distilled off. The production of aqueous secondary dispersions is known to the person skilled in the art and described, for example, in West German Patent No. A-3,720, 860.

To adjust the molecular weight, regulators can be used during the polymerization. The following examples are suitable:
-SH-containing compounds, such as mercaptoethanol, mercaptopropanol, thiophenol, thioglycerol, thioglycolic acid ethyl ester, thioglycolic acid methyl ester, and tert-dodecyl mercaptan.

The solids content of the obtained polymer dispersions is preferably 40-80, particularly preferably 45-75 wt%. High polymer solids content can be established according to methods described in German Patent Application No. P 4,307,683.1 or European Patent No. 37,923.

A preferred polymerization method is solution polymerization. Solution polymerization can be carried out continuously, discontinuously as a batch method, or preferably semicontinuously in the inflow method. In the latter case, some of the monomers are initially present, heated to the polymerization temperature, and the remaining monomers are continuously added.

As solvents for the radical solution polymerization, alcohols, for example, such as i-butanol, i-propanol, aromatics, such as toluene or xylene, ethers, such as dioxane or tetrahydrofuran,

ketones, such as acetone or cyclohexanone, or esters, such as ethyl acetate or n-butyl acetate, can be used.

As preferred initiators, dibenzoyl peroxide, tert-butyl perpivalate, tert-butyl per-2-ethyl hexanoate, tert-amyl-2-ethylhexyl peroxide, di-tert-butyl peroxide, tert-butyl hydroperoxide, cumene hydroperoxide, dilauroyl peroxide, tert-butyl peroxy maleate, tert-butyl peroxy benzoate, dicumyl peroxide, didecanoyl peroxide, methyl ethyl ketone peroxide, 2,2'-azobis(2,4-dimethylvaleronitrile), 2,2'-azobis(2,3-dimethylbutyronitrile), and 2,2'-azobisisobutyronitrile can be mentioned.

During bulk polymerization, generally a part of the polymerization batch is initially present, heated to the polymerization temperature, whereupon subsequently the remainder is continuously supplied.

The polymer is obtained as a function of the selected polymerization method, in the form of an aqueous dispersion of the polymer, a solution in an organic solvent or, essentially, anhydrous and solvent-free.

The polymers can be used as adhesives in these forms. If necessary, additives, such as rheology auxiliaries, thickeners, tackifying resins, for example, colophony rosins, can be added.

In the case of an aqueous dispersion or organic solvent of the polymer, the water or the organic solvent is removed after application, so that the dry polymer film remains.

Aqueous polymer systems have the disadvantage that before the application of the water-absorbing solid particles, water must be removed as extensively as possible, in order to prevent a premature swelling of the water-absorbing solid particles.

Anhydrous polymer systems, for example, organic solutions of the polymer, are therefore preferred.

Particularly preferred are polymer melts (melt adhesives), which are essentially free of water and organic solvents. In this case, a drying step to remove the water or solvent is not necessary after the application of the polymer melt as an adhesive. Melt adhesives can be solid, highly viscous, or fluid at 20°C. Preferably, they are applied as a melt at 50-200°C, particularly preferably at 80-180°.

After the coating with the adhesive and, if necessary, the drying of the coating, the water-absorbing solid particles can be applied, for example, by a simple scattering on the adhesive layer.

As water-absorbing solid particles, for example, silica-gel and superabsorbing particles can be taken into consideration.

Preferred superabsorbers are, for example, homopolymers of methacrylic acid or copolymers with a fraction of at least 30 wt%, with at least 50 wt% methacrylic acid being particularly preferred.

The average particle size of the water-absorbing solid particles is not important for the principle of the invention. Usually, weight-average particle sizes lie in the range of 10-2000 μm . Preferably, the average particle size is smaller than the thickness of the adhesive layer, particularly preferably smaller than half the thickness of the adhesive layer.

The quantity of the water-absorbing solid particles is preferably selected in such a way that 0.1-100 mg water-absorbing solid particles are fixed per 1 cm^2 of the adhesive-coated substrate.

A cross-linking of the polymers in the adhesive layer can preferably be undertaken after or before the application of the

water-absorbing solid particles. Such a cross-linking can take place thermally, for example, if the polymer contains monomers with thermally crosslinked groups.

With particular preference, the cross-linking is carried out by radiation with energy-rich light, for example, with electron beams or UV light. In the case of UV light, the polymer preferably contains copolymerizable, ethylenically unsaturated photoinitiators, as stated above. Suitable photoinitiators can, however, also be admixed to the polymers, although this is less preferred. In particular, the aforementioned melt adhesives are suitable for cross-linking with energy-rich light.

For the irradiation, for example, commercial UV irradiators, which preferably emit in a wavelength range of 250-400 nm irradiation, are used. Suitable are, for example, medium-pressure mercury irradiators with an irradiation output of 80-120 W/cm.

By a cross-linking, in particular with energy-rich light, after the application of the particles, it is particularly feasible to fix, rapidly and firmly, the desired quantity of the water-absorbing solid particles in or on the adhesive layer.

The coated substrates in accordance with the invention can be coated on one or both sides with adhesive, wherein the water-absorbing solid particles can also be applied on one or both sides.

The adhesive layer with the water-absorbing solid particles can be provided with a water-permeable covering. Such coverings are preferably fabrics made of plastic or natural materials, such as cellulose. The fabric preferably has a mesh width smaller than the weight-average diameter of the water-absorbing particles. The fabric can be bonded, for example with the adhesive layer on the

edges of the substrate. The edges corresponding to the bonded width are suitably free of water-absorbing solid particles.

In a preferred specific embodiment, the substrates in accordance with the invention are coated on one side (defined as the upper side) with adhesive and water-absorbing particles fixed therein and on the other side (defined as the underside), only with adhesive without fixed water-absorbing particles.

The substrates coated in this manner are particularly suitable as a portable system for moisture protection. The substrates can thereby be bonded with the underside on objects to be protected from moisture, for example, cables. The substrates coated on both sides can be used in particular in the form of adhesive strips that can be unrolled. With these adhesive strips, the underside provided with the adhesive can be provided with a release paper, such as is generally common otherwise with adhesive strips. The upper side carries the adhesive layer with the fixed water-absorbing particles and preferably not absolutely necessary, with a covering that is bonded, as described above, with the edges of the adhesive strip.

The substrates coated in accordance with the invention are quite suitable for the production of sanitary products, for example, incontinence articles, baby disposable diapers, or sanitary napkins. Moreover, they are suitable for protection from moisture, for example, for objects in electricity, electronics, or in the construction industry.

They can be used in the form of adhesive strips and in this or another form represent a suitable portable system, for example for the finishing of objects with protection from moisture.

Examples

Example 1

A polyester film (Hostaphan® RN 36) was coated with UV-cross-linkable melt adhesive, Acronal® DS 3458 (application weight, 70 g/m²). Subsequently, the superabsorbant (Aqualic AL 76 LF) was scattered thereon. After shaking off the nonfixed SA particles, the film was irradiated with UV light (30 mW/cm², 5 min).

The irradiated film was placed in water to swell. Even after the swelling, the superabsorbant adhered firmly to the film.

Some data regarding the film coated with the UV-melt adhesive:

	UV cross-linked
Weight of the film	0.11 g
Weight after melt adhesive application	0.34 g
Weight after superabsorbant coating	0.64 g
Weight after swelling in water	7.57 g
Water intake (based on superabsorbants)	2,210%

Example 2

A polyester film (Hostaphan® RN 36) was coated with UV-cross-linkable melt adhesive, Acronal® DS 3458 (application weight 70 g/m²). Subsequently, the superabsorbant (Aqualic CAL 76 LF) was scattered in such a way that an approximately 2-cm-wide zone remained free of superabsorbant on the edge of the film. After shaking off nonfixed superabsorbing (SA) particles and irradiation, a polypropylene fabric was placed on a mesh width of 118 µm and bonded with the edge without using additional adhesive.

The composite exhibited, as above, a good water-swelling capacity, wherein the covering fabric did not become detached.

Example 3

A polypropylene fabric with a mesh width of 118 μm was coated with UV-cross-linkable melt adhesive, Acronal® DS 3458 (application weight, 70 g/m²). Here the porosity of the material led to the melt adhesive being on both sides of the fabric. Whereas one side was irradiated and subsequently was coated with release paper, the superabsorbant (Aqualic CAL 76 LF) was scattered on the other side so that an approximately 2-cm-wide zone was free of superabsorbant on the edge of the film. After shaking off nonfixed SA particles and irradiation of the composite, a second polypropylene fabric with a mesh width of 118 μm was bonded without using additional adhesive. After removal of the release paper from the underside, it was possible to fix this composite on any surface. This composite also exhibited a very good water-swelling capacity.

Claims

1. Substrates coated with water-absorbing solid particles, in which at least one side carries an adhesive layer in which water-absorbing solid particles are fixed.
2. Coated substrates according to Claim 1, wherein it is an adhesive layer cross-linked with energy-rich light.
3. Coated substrates according to Claim 1 or 2, wherein the water-absorbing solid particles are superabsorbing particles (SAP) or silica gel.

4. Coated substrates according to one of Claims 1-3, wherein a water-permeable covering is applied onto the adhesive layer with the fixed water-absorbing solid particles, and this covering is bonded with the substrate.

5. Coated substrates according to one of Claims 1-4, wherein one side (defined as the upper side) carries the adhesive particles with the fixed water-absorbing solids and the other side (defined as underside) is also coated with adhesive, but without water-absorbing solid particles.

6. Adhesive strips that can be unrolled and are made of coated substrates in accordance with Claim 5, wherein the underside is provided with a release paper.

7. Use of coated substrates in accordance with one of Claims 1-5 for the production of sanitary products.

8. Sanitary products, containing coated substrates according to one of Claims 1-5.

9. Use of coated substrates according to one of Claims 1-5 as protection from moisture or for the production of products for the protection from moisture.

10. Products for protection from moisture, containing coated substrates according to one of Claims 1-5.

11. Method for the production of substrates coated with water-absorbing solid particles, characterized by the fact that

- a) a substrate is coated with adhesive and, subsequently,
- b) the water-absorbing solid particles are applied.

12. Method according to Claim 11, characterized by the fact that the adhesive is a melt adhesive, and according to method step b), the melt adhesive is cross-linked by energy-rich radiation.

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 95/03602

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A61F13/15

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,4 413 995 (KORPMAN) 8 November 1983 see the whole document see column 4, line 54 - line 61 ---	1-12
X	DE,U,94 02 463 (DEMHARTNER GMBH) 7 April 1994 see claims ---	1,3-11
X	DE,U,93 17 553 (DEMHARTNER) 20 January 1994 see claims ---	1,3-11
X	WO,A,94 01069 (FATER S.P.A.) 20 January 1994 see figures; examples ---	1,3-12
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

International Application No.
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,5 160 331 (FORESTER ET AL) 3 November 1992 see the whole document ---	1,3-12
X	EP,A,0 506 336 (JAMES RIVER CORPORATION OF VIRGINIA) 30 September 1992 see the whole document ---	1,3-12
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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PCT/EP 95/03602

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INTERNATIONAL SEARCH REPORT

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INTERNATIONALER RECHERCHENBERICHT

Internationales Patentzeichen
PCT/EP 95/03602

A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES
IPK 6 A61F13/15

Nach der internationalen Patentklassifikation (IPK) oder nach der nationalen Klassifikation und der IPK

B. RECHERCHIERTE GEBIETE

Recherchierte Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbole)
IPK 6 A61F

Recherchierte aber nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

Während der internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe)

C. ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
X	US,A,4 413 995 (KORPMAN) 8.November 1983 siehe das ganze Dokument siehe Spalte 4, Zeile 54 - Zeile 61 ---	1-12
X	DE,U,94 02 463 (DEMHARTNER GMBH) 7.April 1994 siehe Ansprüche ---	1,3-11
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X	WO,A,94 01069 (FATER S.P.A.) 20.Januar 1994 siehe Abbildungen; Beispiele ---	1,3-12
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C.(Fortsetzung) ALS WESENTLICH ANGESEHENE UNTERLAGEN		
Kategorie	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
X	EP,A,0 506 336 (JAMES RIVER CORPORATION OF VIRGINIA) 30.September 1992 siehe das ganze Dokument ---	1,3-12
X	WO,A,94 02094 (THE PROCTER & GAMBLE COMPANY) 3.Februar 1994 siehe Seite 11, Absatz 2 - Seite 12, Absatz 3 -----	1

INTERNATIONALER RECHERCHENBERICHT

Angaben zu Veröffentlichungen, die zur selben Patentfamilie gehören

Internationales Patentzeichen

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Abstract

At least one face of a substrate coated with water-absorbing solid particles carries a pressure-sensitive adhesive layer in which the water-absorbing solid particles are fixed.

The invention concerns substrates coated with water-absorbing solid particles, in which at least one side carries an adhesive layer in which water-absorbing solid particles are fixed.

Moreover, the invention concerns adhesive strips, which are made of these coated substrates and which can be unrolled, the use of the coated substrates for the production of sanitary products or as protection from moisture, and a method for the production of the coated substrates.

Flat, textile materials with superabsorbing characteristics for the absorption of liquids are becoming increasingly more widespread. Typical fields of application include disposable diapers for babies, sanitary napkins, or products for adult incontinence. Usually, these superabsorbing articles are put together in such a way that they contain a more or less voluminous layer of cellulose (fluff), into which the superabsorbing (SA) particles are scattered. If a liquid reaches this layer, it is absorbed by the SA particles, wherein the liquid is conducted to the particles via the hydrophilic fluff fibers. The water-intake capacity can be a multiple of the material's own weight. The construction is usually used and described here has the disadvantage that it leads to sanitary products that are several mm to cm thick, and thus often only insufficiently fulfill the requirement of appearing as discreetly as possible when these

articles on a human body. This is particularly true for adult incontinence.

There is therefore the need to produce a flat material with a high water-intake capacity which is suitable for the construction of sanitary products, such as incontinence articles, baby disposable diapers or sanitary napkins, and is clearly thinner than the usual fluff-containing products.

Furthermore, there is the need to use water-retaining layers also in other areas. For example, superabsorbing particles are used in the sheathing of submarine cables, in order to protect the conducting material from the penetration of water. Here, the SA particles swell, forming thereby a water-impermeable layer and bulkhead off the interior of the sheathing from the penetration of more liquid. The coating with SA particles is usually carried out by immersing the cable into a liquid containing SA particles. This method is, of course, not a workable way when a repair is needed. A portable system that offers a self-adhesive protection from moisture or water would be desirable here. This portable system could be used, of course, in all other areas also in which water-blocking layers are desired as moisture protection, as in the construction industry, for example.

In the unpublished German Patent Application No. P 4,411,896.1 (our Ref. 44788), the binding of superabsorbing particles of nonwoven fabrics with the aid of the binder of the nonwoven fabrics is described. The products produced in this manner are suitable for the production of thin sanitary articles, but not as a portable system for moisture protection, as described above.

The goal of the invention under consideration was therefore water-absorbing material suitable for the production of thin sanitary products and as a portable system for moisture protection.

Accordingly, the coated substances defined in the beginning and their use for the production of sanitary products or as moisture protection were found. A method was also found for the production of the coated substrates.

The substrates coated in accordance with the invention are generally flat substrates. In particular, they are, for example, paper, films, for example made of metal or plastic, or fabrics made of natural or synthetic fibers. Preferred are plastic films made of polyester, such as polyethylene terephthalate, or polyolefins, such as polyethylene, polypropylene, oriented polypropylene or polyamides. Preferred fabrics are those made of plastic, for example polyolefins or polyamides.

The substrates are coated on at least one side with an adhesive. The adhesive layer preferably has a thickness smaller than 1 mm, in particular 1-200 μm .

As an adhesive, one can use all common adhesives. Preferably, adhesives based on a radically polymerized polymer, synthesized from radically polymerizable monomers.

The polymer preferably consists of at least in part so-called main monomers, also selected $\text{C}_1\text{-C}_{20}$ -alkyl (meth)acrylates, vinyl esters from carboxylic acids containing up to 20 C atoms, vinyl aromatics with up to 20 C atoms, ethylenically unsaturated nitriles, vinyl halides, vinyl ethers of alcohols containing 1-10 C atoms, aliphatic hydrocarbons with 2-8 C atoms and 1 or 2 double bonds or mixtures of these monomers. The polymer preferably consists of at least 40 wt%, particularly preferable, 60 wt%, and very particularly preferable 75 wt% of these main monomers or their mixtures.

One can mention, for example, methacrylic acid alkyl ester with a $\text{C}_1\text{-C}_{10}$ -alkyl radical, such as methyl methacrylate, methyl

acrylate, n-butyl acrylate, ethyl acrylate, and 2-ethylhexyl acrylate.

In particular, mixtures of the methacrylic acid alkyl esters are also suitable.

Vinyl esters of carboxylic acids with 1-20 C atoms are, for example, vinyl laurate, vinyl stearate, vinyl propionate, Versatic acid vinyl ester, and vinyl acetate.

As vinyl aromatic compounds, vinyltoluene, α - and p-methylstyrene, α -butylstyrene, 4-n-butylstyrene, 4-n-decylstyrene and, preferably, styrene can be taken into consideration. Examples of nitriles are acrylonitrile and methacrylonitrile.

The vinyl halides are ethylenically unsaturated compounds, substituted with chlorine, fluorine, or bromine, preferably vinyl chloride and vinylidene chloride.

As vinyl ethers, one can mention, for example, vinyl methyl ether or vinyl isobutyl ether. Vinyl ethers of alcohols containing 1-4 C atoms is preferred.

As hydrocarbons with 2-8 C atoms and two olefinic double bonds, one can mention butadiene, isoprene, and chloroprene.

In addition to these main monomers, other monomers, for example, hydroxy group-containing monomers, in particular C_1 - C_{10} -hydroxyalkyl methacrylates, methacrylamide, ethylenically unsaturated acids, in particular carboxylic acids, such as methacrylic acid or itaconic acid, dicarboxylic acids and their anhydrides or semiesters, for example, maleic acid, fumaric acid, and maleic anhydride, can be contained in the polymer.

The polymer can contain, if necessary, cross-linking monomers with 2 or more double bonds as additional monomers also. The content of the crosslinking monomers is generally, if desired at all, 0.05-5 wt%, based on the polymer.

In the case of polymers that can be cross-linked by UV radiation, copolymerizable, ethylenically unsaturated photoinitiators, for example, acetophenone or benzophenone derivatives, can also be taken into consideration as additional monomers, as they are known, for example, from European Patent No. A-246,848 or German Patent No. A-3,844,445. In the case of their joint use, their fraction generally is 0.05-5, preferably 0.1 to 3 wt%.

The production of the polymers, for example, by radical polymerization can, for example, be carried out in solution, for example, of an organic solvent (solution polymerization), in aqueous dispersion (emulsion polymerization, suspension polymerization) or in bulk--that is, essentially in the absence of water or organic solvents (bulk polymerization).

The emulsion polymerization can be carried out, for example, discontinuously, with or without the use of seed latexes, with the presence of all or individual components of the reaction mixture, or preferably with a partial presence and subsequent metering in of the components or of the individual components of the reaction mixture, or according to the metering method without the initial presence of the components.

The monomers can be polymerized during an emulsion polymerization, as usual, in the presence of a water-soluble initiator and an emulsifier at preferably 30-95°C.

Suitable initiators are, for example, sodium, potassium, and ammonium persulfate, tert-butyl hydroperoxides, water-soluble azo compounds or also redox initiators, such as H_2O_2 /ascorbic acid.

As emulsifiers, for example, alkali metal salts of longer-chain fatty acids, alkyl sulfates, alkyl sulfonates, alkylated aryl sulfonates, or alkylated biphenyl ether sulfonates are used.

Moreover, reaction products of alkylene oxides, in particular ethylene or propylene oxide with fatty alcohols, acids, or phenol, or alkyl phenols can be taken into consideration as emulsifiers.

In the case of aqueous secondary dispersions, the copolymer is first produced by solution polymerization in an organic solvent and subsequently with the addition of salt-forming agents, for example, of ammonia to carboxylic acid group-containing copolymers, dispersed in water without the use of an emulsifier or dispergator. The organic solvent can be distilled off. The production of aqueous secondary dispersions is known to the person skilled in the art and described, for example, in West German Patent No. A-3,720, 860.

To adjust the molecular weight, regulators can be used during the polymerization. The following examples are suitable:
-SH-containing compounds, such as mercaptoethanol, mercaptopropanol, thiophenol, thioglycerol, thioglycolic acid ethyl ester, thioglycolic acid methyl ester, and tert-dodecyl mercaptan.

The solids content of the obtained polymer dispersions is preferably 40-80, particularly preferably 45-75 wt%. High polymer solids content can be established according to methods described in German Patent Application No. P 4,307,683.1 or European Patent No. 37,923.

A preferred polymerization method is solution polymerization. Solution polymerization can be carried out continuously, discontinuously as a batch method, or preferably semicontinuously in the inflow method. In the latter case, some of the monomers are initially present, heated to the polymerization temperature, and the remaining monomers are continuously added.

As solvents for the radical solution polymerization, alcohols, for example, such as i-butanol, i-propanol, aromatics, such as toluene or xylene, ethers, such as dioxane or tetrahydrofuran,

ketones, such as acetone or cyclohexanone, or esters, such as ethyl acetate or n-butyl acetate, can be used.

As preferred initiators, dibenzoyl peroxide, tert-butyl perpivalate, tert-butyl per-2-ethyl hexanoate, tert-amyl-2-ethylhexyl peroxide, di-tert-butyl peroxide, tert-butyl hydroperoxide, cumene hydroperoxide, dilauroyl peroxide, tert-butyl peroxy maleate, tert-butylperoxybenzoate, dicumyl peroxide, didecanoyl peroxide, methyl ethyl ketone peroxide, 2,2'-azobis(2,4-dimethylvaleronitrile), 2,2'-azobis(2,3-dimethylbutyronitrile), and 2,2'-azobisisobutyronitrile can be mentioned.

During bulk polymerization, generally a part of the polymerization batch is initially present, heated to the polymerization temperature, whereupon subsequently the remainder is continuously supplied.

The polymer is obtained as a function of the selected polymerization method, in the form of an aqueous dispersion of the polymer, a solution in an organic solvent or, essentially, anhydrous and solvent-free.

The polymers can be used as adhesives in these forms. If necessary, additives, such as rheology auxiliaries, thickeners, tackifying resins, for example, colophony rosins, can be added.

In the case of an aqueous dispersion or organic solvent of the polymer, the water or the organic solvent is removed after application, so that the dry polymer film remains.

Aqueous polymer systems have the disadvantage that before the application of the water-absorbing solid particles, water must be removed as extensively as possible, in order to prevent a premature swelling of the water-absorbing solid particles.

Anhydrous polymer systems, for example, organic solutions of the polymer, are therefore preferred.

Particularly preferred are polymer melts (melt adhesives), which are essentially free of water and organic solvents. In this case, a drying step to remove the water or solvent is not necessary after the application of the polymer melt as an adhesive. Melt adhesives can be solid, highly viscous, or fluid at 20°C. Preferably, they are applied as a melt at 50-200°C, particularly preferably at 80-180°.

After the coating with the adhesive and, if necessary, the drying of the coating, the water-absorbing solid particles can be applied, for example, by a simple scattering on the adhesive layer.

As water-absorbing solid particles, for example, silica-gel and superabsorbing particles can be taken into consideration.

Preferred superabsorbers are, for example, homopolymers of methacrylic acid or copolymers with a fraction of at least 30 wt%, with at least 50 wt% methacrylic acid being particularly preferred.

The average particle size of the water-absorbing solid particles is not important for the principle of the invention. Usually, weight-average particle sizes lie in the range of 10-2000 μm . Preferably, the average particle size is smaller than the thickness of the adhesive layer, particularly preferably smaller than half the thickness of the adhesive layer.

The quantity of the water-absorbing solid particles is preferably selected in such a way that 0.1-100 mg water-absorbing solid particles are fixed per 1 cm^2 of the adhesive-coated substrate.

A cross-linking of the polymers in the adhesive layer can preferably be undertaken after or before the application of the

water-absorbing solid particles. Such a cross-linking can take place thermally, for example, if the polymer contains monomers with thermally crosslinked groups.

With particular preference, the cross-linking is carried out by radiation with energy-rich light, for example, with electron beams or UV light. In the case of UV light, the polymer preferably contains copolymerizable, ethylenically unsaturated photoinitiators, as stated above. Suitable photoinitiators can, however, also be admixed to the polymers, although this is less preferred. In particular, the aforementioned melt adhesives are suitable for cross-linking with energy-rich light.

For the irradiation, for example, commercial UV irradiators, which preferably emit in a wavelength range of 250-400 nm irradiation, are used. Suitable are, for example, medium-pressure mercury irradiators with an irradiation output of 80-120 W/cm.

By a cross-linking, in particular with energy-rich light, after the application of the particles, it is particularly feasible to fix, rapidly and firmly, the desired quantity of the water-absorbing solid particles in or on the adhesive layer.

The coated substrates in accordance with the invention can be coated on one or both sides with adhesive, wherein the water-absorbing solid particles can also be applied on one or both sides.

The adhesive layer with the water-absorbing solid particles can be provided with a water-permeable covering. Such coverings are preferably fabrics made of plastic or natural materials, such as cellulose. The fabric preferably has a mesh width smaller than the weight-average diameter of the water-absorbing particles. The fabric can be bonded, for example with the adhesive layer on the

edges of the substrate. The edges corresponding to the bonded width are suitably free of water-absorbing solid particles.

In a preferred specific embodiment, the substrates in accordance with the invention are coated on one side (defined as the upper side) with adhesive and water-absorbing particles fixed therein and on the other side (defined as the underside), only with adhesive without fixed water-absorbing particles.

The substrates coated in this manner are particularly suitable as a portable system for moisture protection. The substrates can thereby be bonded with the underside on objects to be protected from moisture, for example, cables. The substrates coated on both sides can be used in particular in the form of adhesive strips that can be unrolled. With these adhesive strips, the underside provided with the adhesive can be provided with a release paper, such as is generally common otherwise with adhesive strips. The upper side carries the adhesive layer with the fixed water-absorbing particles and preferably not absolutely necessary, with a covering that is bonded, as described above, with the edges of the adhesive strip.

The substrates coated in accordance with the invention are quite suitable for the production of sanitary products, for example, incontinence articles, baby disposable diapers, or sanitary napkins. Moreover, they are suitable for protection from moisture, for example, for objects in electricity, electronics, or in the construction industry.

They can be used in the form of adhesive strips and in this or another form represent a suitable portable system, for example for the finishing of objects with protection from moisture.

Examples

Example 1

A polyester film (Hostaphan® RN 36) was coated with UV-cross-linkable melt adhesive, Acronal® DS 3458 (application weight, 70 g/m²). Subsequently, the superabsorbant (Aqualic AL 76 LF) was scattered thereon. After shaking off the nonfixed SA particles, the film was irradiated with UV light (30 mW/cm², 5 min).

The irradiated film was placed in water to swell. Even after the swelling, the superabsorbant adhered firmly to the film.

Some data regarding the film coated with the UV-melt adhesive:

	UV cross-linked
Weight of the film	0.11 g
Weight after melt adhesive application	0.34 g
Weight after superabsorbant coating	0.64 g
Weight after swelling in water	7.57 g
Water intake (based on superabsorbants)	2,210%

Example 2

A polyester film (Hostaphan® RN 36) was coated with UV-cross-linkable melt adhesive, Acronal® DS 3458 (application weight 70 g/m²). Subsequently, the superabsorbant (Aqualic CAL 76 LF) was scattered in such a way that an approximately 2-cm-wide zone remained free of superabsorbant on the edge of the film. After shaking off nonfixed superabsorbing (SA) particles and irradiation, a polypropylene fabric was placed on a mesh width of 118 µm and bonded with the edge without using additional adhesive.

The composite exhibited, as above, a good water-swelling capacity, wherein the covering fabric did not become detached.

Example 3

A polypropylene fabric with a mesh width of 118 μm was coated with UV-cross-linkable melt adhesive, Acronal® DS 3458 (application weight, 70 g/m²). Here the porosity of the material led to the melt adhesive being on both sides of the fabric. Whereas one side was irradiated and subsequently was coated with release paper, the superabsorbant (Aqualic CAL 76 LF) was scattered on the other side so that an approximately 2-cm-wide zone was free of superabsorbant on the edge of the film. After shaking off nonfixed SA particles and irradiation of the composite, a second polypropylene fabric with a mesh width of 118 μm was bonded without using additional adhesive. After removal of the release paper from the underside, it was possible to fix this composite on any surface. This composite also exhibited a very good water-swelling capacity.

Claims

1. Substrates coated with water-absorbing solid particles, in which at least one side carries an adhesive layer in which water-absorbing solid particles are fixed.
2. Coated substrates according to Claim 1, wherein it is an adhesive layer cross-linked with energy-rich light.
3. Coated substrates according to Claim 1 or 2, wherein the water-absorbing solid particles are superabsorbing particles (SAP) or silica gel.

4. Coated substrates according to one of Claims 1-3, wherein a water-permeable covering is applied onto the adhesive layer with the fixed water-absorbing solid particles, and this covering is bonded with the substrate.

5. Coated substrates according to one of Claims 1-4, wherein one side (defined as the upper side) carries the adhesive particles with the fixed water-absorbing solids and the other side (defined as underside) is also coated with adhesive, but without water-absorbing solid particles.

6. Adhesive strips that can be unrolled and are made of coated substrates in accordance with Claim 5, wherein the underside is provided with a release paper.

7. Use of coated substrates in accordance with one of Claims 1-5 for the production of sanitary products.

8. Sanitary products, containing coated substrates according to one of Claims 1-5.

9. Use of coated substrates according to one of Claims 1-5 as protection from moisture or for the production of products for the protection from moisture.

10. Products for protection from moisture, containing coated substrates according to one of Claims 1-5.

11. Method for the production of substrates coated with water-absorbing solid particles, characterized by the fact that

- a) a substrate is coated with adhesive and, subsequently,
- b) the water-absorbing solid particles are applied.

12. Method according to Claim 11, characterized by the fact that the adhesive is a melt adhesive, and according to method step b), the melt adhesive is cross-linked by energy-rich radiation.

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/EP 95/03602

A. CLASSIFICATION OF SUBJECT MATTER IPC 6 A61F13/15		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC 6 A61F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,4 413 995 (KORPMAN) 8 November 1983 see the whole document see column 4, line 54 - line 61 ---	1-12
X	DE,U,94 02 463 (DEMHARTNER GMBH) 7 April 1994 see claims ---	1,3-11
X	DE,U,93 17 553 (DEMHARTNER) 20 January 1994 see claims ---	1,3-11
X	WO,A,94 01069 (FATER S.P.A.) 20 January 1994 see figures; examples ---	1,3-12
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Date of the actual completion of the international search 21 February 1996		Date of mailing of the international search report 27. 02. 96
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016		Authorized officer Douskas, K

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES
IPK 6 A61F13/15

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Recherchierte Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbol)
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Recherchierte aber nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

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